CLAIMS

1. A method of demodulating a multilevel signal comprising the steps of:

(a) assigning a value to a bit representing said demodulated signal;

(a) identifying at least one signal constellation vector proximate to said multilevel signal; and

(b) determining a reliability measure for said bit of said demodulated signal if said bit occupies a bit position corresponding to a bit position of said at least one proximate constellation vector occupied by a bit of varying value.

2. The method of claim 1 wherein the step of identifying at least one signal constellation vector proximate to said multilevel signal comprises the steps of:

(a) determining a first and a second phase component of said multilevel signal;

(b) identifying a constellation vector having a first and a second phase component of maximized absolute value but not exceeding an absolute value of said first and said second phase components of said multilevel signal;

(c) identifying any constellation vector having one phase component of maximized absolute value but not exceeding said absolute value of said corresponding phase component of said multilevel signal and another phase component of minimized absolute value but not less than said corresponding phase component of said multilevel signal; and

(d) identifying any constellation vector having said first and said second phase components of minimized absolute value but not less than said corresponding phase component of said multilevel signal.

3. The method of claim 2 further comprising the step of identifying a center of gravity equal distant from said proximate constellation vectors and having first and second center of gravity phase coordinates.

4. The method of claim 3 wherein said reliability measure is a function of a difference between at least one of said first and said second phase components of said multilevel signal and said center of gravity phase coordinates.

5. A method of demodulating a multilevel signal comprising the steps of:

(a) identifying a neighborhood of a signal constellation in proximity to said signal, said neighborhood defined by a set of at least one constellation signal;

(b) assigning a hard decision value to a bit of said demodulated signal if said demodulated signal bit occupies a bit position corresponding to a position of a bit having a constant value for all constellation signals of said set defining said neighborhood;

(c) determining a center of gravity of said neighborhood; and

(d) assigning a value and a reliability measure to a demodulated signal bit if said demodulated signal bit occupies a bit position corresponding to a position of a bit having a variable value for constellation signals of said set defining said neighborhood.

6. The method of claim 5 wherein said reliability measure is a function of a relative position of said multilevel signal and said center of gravity of said neighborhood.

7. The method of claim 5 wherein said reliability measure is a distance between said multilevel signal and said center of gravity of said neighborhood.

8. The method of claim 5 wherein said reliability measure comprises a difference between a quadrature component of said multilevel signal and a quadrature component of said neighborhood center of gravity.

9. The method of claim 5 wherein said reliability measure comprises a difference between an in-phase component of said multilevel signal and an in-phase component of said neighborhood center of gravity.

10. A method of demodulating a signal comprising:

(a) acquiring a multi-level modulated signal;

(b) locating said acquired signal relative to a constellation of signal vectors; said signal vectors represented by a plurality of bits;

(c) identifying a plurality of said signal vectors defining a neighborhood of said constellation nearest said acquired signal;

(d) determining a center of gravity of said neighborhood;

(e) assigning a value to a bit representing said acquired signal if a corresponding bit is constant for said plurality of neighborhood defining vectors; and

(f) assigning a value and a measure of reliability of said value to a bit of said acquired signal if a corresponding bit varies for said plurality of neighborhood defining vectors.

11. The method of claim 10 further comprising assigning a value to a bit representing said acquired signal if said neighborhood is defined by a single signal vector.

12. The method of claim 10 wherein said reliability measure is a function of a relative position of said acquired signal and said center of gravity of said neighborhood.

13. The method of claim 10 wherein said reliability measure is a distance between said acquired signal and said center of gravity of said neighborhood.

14. The method of claim 10 wherein said reliability measure comprises a difference between a quadrature component of said acquired signal and a quadrature component of said neighborhood center of gravity.

15. The method of claim 10 wherein said reliability measure comprises a difference between an in-phase component of said acquired signal and an in-phase component of said neighborhood center of gravity.

16. The method of claim 10 wherein said constellation of signal vectors is ordered according to a Gray code.

17. A method of demodulating a multi-level signal comprising:

(a) comparing a reliability of at least two bits of said demodulated multilevel signal;

(b) assigning a hard decision value to a bit associated with a greater reliability; and

(c) assigning a soft decision value to a bit associated with a lesser reliability.

18. The method of claim 17 wherein said reliability is measured by a log likelihood ratio.

19. The method of claim 17 wherein the step of assigning a soft decision value to said bits associated with a lesser reliability comprises the steps of:

(a) assigning a value to said bit; and

(b) assigning a measure of reliability to said bit.

20. The method of claim 19 wherein said measure of reliability is a log likelihood ratio

21. The method of claim 17 further comprising the steps of:

(a) limiting said measure of reliability to a predetermined range; and

(b) providing a soft decision value to bits of said demodulated multilevel signal associated a measure of reliability having values not exceeding a limiting value of said range.

22. The method of claim 21 wherein said limiting value of said range equals a function of a number of bits demodulated with a soft decision.

23. A method of demodulating a multi-level signal comprising:

(a) limiting a measure of reliability to a predetermined range; and

(b) providing a soft decision value to bits of said demodulated multilevel signal associated a measure of reliability having values not exceeding a limiting value of said range.

24. The method of claim 23 wherein said measure of reliability is a log likelihood ratio

25. The method of claim 23 wherein said limiting value of said range equals a number of bits demodulated with a soft decision.